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EXAMINER	
LEE, SHUN K	

ART UNIT	PAPER NUMBER
2884	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/509,035	ITO ET AL.	
	Examiner	Art Unit	
	Shun Lee	2884	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-20 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-20 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 27 September 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 20040927.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

National Stage Application

Specification

1. The disclosure is objected to because of the following informalities: "data lines 17" in paragraph 54 should probably be --data lines 18-- (37 CFR 1.437 and PCT Rule 11.13(m)). Appropriate correction is required.

2. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

3. Claims 1, 3, 5, 6, and 10-14 are objected to because of the following informalities:

(a) in claim 1, "the fluorescent material" on line 8 should probably be --the partition fluorescent material-- and "a fluorescent material" on line 5 should probably be --a partition fluorescent material-- (to avoid confusion with "a fluorescent material I" on line 3 of claim 1);

(b) in claim 3, "the fluorescent" on line 2 and again on line 4 should probably be --the partition fluorescent-- (to avoid confusion with "a fluorescent material I" on line 3 of claim 1);

(c) in claim 5, "light equal" on line 4 should probably be --light of the fluorescent material II equal--;

(d) in claim 6, "light equal" on line 4 should probably be --light of the fluorescent material III equal--;

(e) in claim 10, "the fluorescent material" on line 8 should probably be --the partition fluorescent material-- and "a fluorescent material" on line 6 should probably be --a partition fluorescent material-- (to avoid confusion with "fluorescent material I" on line 5 of claim 10);

(f) in claim 11, "the fluorescent material" on line 8 should probably be --the partition fluorescent material-- and "a fluorescent material" on line 6 should probably be --a partition fluorescent material-- (to avoid confusion with "fluorescent material I" on line 5 of claim 11);

(g) in claim 12, "the fluorescent material" on line 8 should probably be --the partition fluorescent material-- and "a fluorescent material" on line 6 should probably be --a partition fluorescent material-- (to avoid confusion with "fluorescent material I" on line 5 of claim 12);

(h) in claim 12, "the fluorescent material II and/or the fluorescent material III" on line 15 should probably be --a fluorescent material II and/or a fluorescent material III--;

(i) in claim 13, "the fluorescent material" on line 8 should probably be --the partition fluorescent material-- and "a fluorescent material" on line 6 should probably be --a partition fluorescent material-- (to avoid confusion with "fluorescent material I" on line 5 of claim 13); and

(j) in claim 14, "the fluorescent" on line 2 and again on line 3 should probably be --the partition fluorescent-- (to avoid confusion with "a fluorescent material I" on line 3 of claim 1).

Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-3, 7, 11, and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Iwabuchi *et al.* (JP 2000-321689). US 6,541,773 appears to correspond to JP 2000-321689.

In regard to claim **1**, Iwabuchi *et al.* disclose an X-ray detector, comprising:

(a) a photoelectric converting section (20 in Fig. 3) of a pixel unit,

(b) scintillator pixels (12 in Figs. 1 and 2) containing a fluorescent material I formed on individual pixels of the photoelectric converting section (20 in Fig. 3), and

(c) a partition (11 in Figs. 1 and 2) containing a fluorescent material and/or a nonfluorescent material disposed between the scintillator pixels (12 in Figs. 1 and 2),

wherein, when an average particle diameter of the fluorescent material I is Ds (*e.g.*, 5 μm; US 6,541,773 column 8, lines 11-15) and an average particle diameter of

the fluorescent material and/or the nonfluorescent material is Dw (*e.g.*, 1 μm; US 6,541,773 column 8, lines 24-28), Ds>Dw (*i.e.*, 5 μm>1 μm) is satisfied.

In regard to claim **2** which is dependent on claim 1, Iwabuchi *et al.* also disclose that when a thickness of the scintillator pixels is Ts (*e.g.*, 50 μm thickness; US 6,541,773 column 8, lines 19-21), an average particle diameter of the fluorescent material I in the scintillator pixels is Ds (*e.g.*, 5 μm; US 6,541,773 column 8, lines 11-15), and a packing density of the fluorescent material I within the scintillator pixels is Fs (*e.g.*, 52% volume ratio; US 6,541,773 column 8, lines 19-21), Ds≥TsFs/10 (*i.e.*, 5 μm≥50 μm*0.52/10) is satisfied.

In regard to claim **3** (which is dependent on claim 1) and claim **14** (which is dependent on claim 2), Iwabuchi *et al.* also disclose that when a thickness of the partition is Tw (*e.g.*, 30 μm thickness; US 6,541,773 column 8, lines 28-33), an average particle diameter of the fluorescent material and/or the nonfluorescent material within the partition is Dw (*e.g.*, 1 μm; US 6,541,773 column 8, lines 24-28), and a packing density of the fluorescent material and/or the nonfluorescent material within the partition is Fw (*e.g.*, 51% volume ratio; US 6,541,773 column 8, lines 28-33), Dw≤TwFw/10 (*i.e.*, 1 μm≤30 μm*0.51/10) is satisfied.

In regard to claim **7** which is dependent on claim 1, Iwabuchi *et al.* also disclose (US 6,541,773 column 5, lines 11-17) that the fluorescent material I comprises Gd_2O_2S as a base material.

In regard to claim **11**, Iwabuchi *et al.* disclose a method for producing an X-ray detector comprising a photoelectric converting section of a pixel unit, scintillator pixels

containing a fluorescent material I formed on individual pixels of the photoelectric converting section, and a partition containing a fluorescent material and/or a nonfluorescent material disposed between the scintillator pixels, wherein, when an average particle diameter of the fluorescent material I is Ds and an average particle diameter of the fluorescent material and/or the nonfluorescent material is Dw, Ds>Dw is satisfied, the method comprising:

(a) forming (US 6,541,773 column 6, lines 28-34) a layer containing a fluorescent material II and/or a fluorescent material III (US 6,541,773 column 6, lines 63-66) on the photoelectric converting section (20 in Fig. 3) of the pixel unit;

(b) removing (*i.e.*, etching; US 6,541,773 column 6, lines 28-34) a portion from the layer; and

(c) forming the scintillator pixels by filling (US 6,541,773 column 6, lines 28-34) the portion removed with a material containing the fluorescent material I.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation

under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 4 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwabuchi *et al.* (JP 2000-321689) in view of Mathers *et al.* (US 4,507,560).

In regard to claim **4** (which is dependent on claim 3) and claim **15** (which is dependent on claim 14), the detector of Iwabuchi *et al.* lacks an explicit description that the scintillator pixels containing the fluorescent material I are formed of a sintered body of the fluorescent material I. However, Iwabuchi *et al.* also disclose (US 6,541,773 column 5, lines 11-17) that the scintillator may be any known phosphor singly or in combination. Since Iwabuchi *et al.* do not disclose and/or require a specific phosphor, one having ordinary skill in the art at the time of the invention would reasonably interpret the unspecified phosphor of Iwabuchi *et al.* as any combination of the known conventional phosphors that would not require further description. Further, Mathers *et al.* teaches (column 2, lines 14-48) that x-ray phosphors are formed by firing (*i.e.*, sintering) a mixture of particulate starting material. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide a conventional phosphor (*e.g.*, a sintered body of fluorescent material) as the unspecified phosphor in the detector of Iwabuchi *et al.*

9. Claims 5, 6, 8, 9, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwabuchi *et al.* (JP 2000-321689) in view of Joiner, Jr. (US 4,491,620).

In regard to claim **5** which is dependent on claim 1, the detector of Iwabuchi *et al.* lacks an explicit description that the partition contains a fluorescent material II which has optical characteristics different from those of the fluorescent material I contained in the scintillator pixels and the longest wavelength of fluorescent light equal to or longer than the shortest wavelength of fluorescent light of the fluorescent material I. However, Iwabuchi *et al.* also disclose (US 6,541,773 column 5, lines 11-17) that the scintillator may be any known phosphor singly or in combination and (US 6,541,773 column 6, lines 63-66) that the partition may also contain a phosphor. Since Iwabuchi *et al.* do not disclose and/or require specific phosphors, one having ordinary skill in the art at the time of the invention would reasonably interpret the unspecified phosphors of Iwabuchi *et al.* as any combination of the known conventional phosphors that would not require further description. Further, Joiner, Jr. teaches (column 3, lines 11-36) that the luminescence from phosphors occur in the ultraviolet, blue, green, or red portion of the spectrum depending on which phosphor is used. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide a conventional phosphor (*e.g.*, a green phosphor) for the unspecified scintillator phosphor and a conventional phosphor (*e.g.*, a red phosphor) for the unspecified partition phosphor in the detector of Iwabuchi *et al.*

In regard to claims **6**, **8**, and **9**, which are dependent on claim 5, the detector of Iwabuchi *et al.* lacks an explicit description that the partition contains a fluorescent material III (comprising Gd_2O_2S as a base material or a fluorescent material having the longest fluorescent wavelength in an ultraviolet region) which has optical characteristics different from those of the fluorescent material I contained in the scintillator pixels and the shortest wavelength of fluorescent light equal to or shorter than the longest fluorescence excitation wavelength of the fluorescent material I. However, Iwabuchi *et al.* also disclose (US 6,541,773 column 5, lines 11-17) that the scintillator may be any known phosphor singly or in combination and (US 6,541,773 column 6, lines 63-66) that the partition may also contain a phosphor. Since Iwabuchi *et al.* do not disclose and/or require specific phosphors, one having ordinary skill in the art at the time of the invention would reasonably interpret the unspecified phosphors of Iwabuchi *et al.* as any combination of the known conventional phosphors that would not require further description. Further, Joiner, Jr. teaches (column 3, lines 11-36) that the luminescence from phosphors occur in the ultraviolet, blue, green, or red portion of the spectrum depending on which phosphor is used. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide a conventional phosphor (*e.g.*, a green phosphor) for the unspecified scintillator phosphor and a conventional phosphor (*e.g.*, an UV phosphor or Gd_2O_2S) for the unspecified partition phosphor in the detector of Iwabuchi *et al.*

In regard to claim **16** which is dependent on claim 8, the emission spectrum is an inherent property of the Gd_2O_2S scintillator. Claim 16 appears to recite only an inherent

property which does not imply any additional structural limitation. Therefore, applicant is advised that should claim 8 be found allowable, claim 16 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

10. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Iwabuchi *et al.* (JP 2000-321689) in view of Tran *et al.* (US 5,391,879).

In regard to claim **10**, the method of Iwabuchi *et al.* lacks an explicit description of forming a layer containing the fluorescent material I on the photoelectric converting section of the pixel unit; forming the scintillator pixels by removing a portion from the layer; and forming the partition by filling a material containing a fluorescent material II and/or a fluorescent material III into the portion removed. However, Iwabuchi *et al.* also disclose (US 6,541,773 column 6, lines 13-39) that phosphor screen can be fabricated using different techniques. Since Iwabuchi *et al.* do not disclose and/or require specific fabrication technique, one having ordinary skill in the art at the time of the invention would reasonably interpret the unspecified fabrication technique of Iwabuchi *et al.* as any combination of the known conventional fabrication techniques that would not require further description. Further, Tran *et al.* teach (column 7, line 52 to column 8, line 2) that pixelized phosphor screens can be fabricated by filling the removed portions of a deposited scintillator phosphor layer with a phosphor of the same or a different composition. Therefore it would have been obvious to one having ordinary skill in the

art at the time of the invention to use a conventional phosphor screen fabrication technique (*e.g.*, filling the removed portions of a deposited scintillator phosphor layer with a different phosphor) for the unspecified phosphor screen fabrication technique in the method of Iwabuchi *et al.*

11. Claims 12, 13, 17, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwabuchi *et al.* (JP 2000-321689) in view of Cusano *et al.* (US 4,415,808) and Riedner *et al.* (US 6,448,566).

In regard to claims **12** and **17**, the method of Iwabuchi *et al.* lacks forming a temporary pixel of the organic material (comprising a resin) or the inorganic material by removing a portion from a layer of an organic material or an inorganic material formed on the photoelectric converting section of the pixel unit; forming the partition by filling the portion removed with a material containing the fluorescent material II and/or the fluorescent material III; and forming the scintillator pixels by filling the removed pixels with a material containing the fluorescent material I. However, Iwabuchi *et al.* also disclose (US 6,541,773 column 6, lines 13-39) that phosphor screen can be fabricated using different techniques. Since Iwabuchi *et al.* do not disclose and/or require specific fabrication technique, one having ordinary skill in the art at the time of the invention would reasonably interpret the unspecified fabrication technique of Iwabuchi *et al.* as any combination of the known conventional fabrication techniques that would not require further description. Further, Cusano *et al.* teach (column 3, lines 42-48) that scintillators can be shaped in a mold, in order to eliminate costly machining or grinding steps. In addition, Riedner *et al.* teach (column 3, lines 4-10 and 42-48) that sacrificial

layers comprising *e.g.*, polymer (*i.e.*, a resin) are used to form gaps that can be filled, in order to form a pixilated scintillator screen. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to use a conventional molding technique (*e.g.*, a lost mold technique wherein the lost mold forms temporary resin pixels) in the method of Iwabuchi *et al.*, in order to form a pixilated scintillator screen while eliminating costly machining or grinding steps.

In regard to claims **13** and **19**, the method of Iwabuchi *et al.* lacks forming a temporary partition of the organic material or the inorganic material by removing a portion from a layer of an organic material (comprising a resin) or an inorganic material formed on the photoelectric converting section of the pixel unit; forming the scintillator pixels by filling the portion removed with a material containing the fluorescent material I; and forming the partition by filling the removed temporary partition with a material containing a fluorescent material II and/or a fluorescent material III. However, Iwabuchi *et al.* also disclose (US 6,541,773 column 6, lines 13-39) that phosphor screen can be fabricated using different techniques. Since Iwabuchi *et al.* do not disclose and/or require specific fabrication technique, one having ordinary skill in the art at the time of the invention would reasonably interpret the unspecified fabrication technique of Iwabuchi *et al.* as any combination of the known conventional fabrication techniques that would not require further description. Further, Cusano *et al.* teach (column 3, lines 42-48) that scintillators can be shaped in a mold, in order to eliminate costly machining or grinding steps. In addition, Riedner *et al.* teach (column 3, lines 4-10 and 42-48) that sacrificial layers comprising *e.g.*, polymer (*i.e.*, a resin) are used to form gaps that can

be filled, in order to form a pixilated scintillator screen. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to use a conventional molding technique (*e.g.*, a lost mold technique wherein the lost mold forms temporary resin partitions) in the method of Iwabuchi *et al.*, in order to form a pixilated scintillator screen while eliminating costly machining or grinding steps.

12. Claims 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwabuchi *et al.* (JP 2000-321689) in view of Cusano *et al.* (US 4,415,808) and Riedner *et al.* (US 6,448,566) as applied to claims 12 and 20 above, and further in view of Tousignant *et al.* (US 5,249,358).

In regard to claim **18** (which is dependent on claim 12) and claim **20** (which is dependent on claim 13), the modified method of Iwabuchi *et al.* lacks that the inorganic material comprises a metal. However, Riedner *et al.* also disclose (column 4, lines 4-7) that sacrificial material comprises a low melting point or easily dissolvable material. Further, Tousignant *et al.* teach (column 8, lines 17-35) that sacrificial material comprising a low melting point or easily dissolvable material (*e.g.*, plastic or metal) are commercially available. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to use a conventional molding technique (*e.g.*, a lost mold technique wherein the lost mold comprises a low melting point or easily dissolvable metal) in the modified method of Iwabuchi *et al.*, in order to form a pixilated scintillator screen while eliminating costly machining or grinding steps.

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shun Lee whose telephone number is (571) 272-2439. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (571) 272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SL

CONSTANTINE HANNAHER
PRIMARY EXAMINER